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EXAMINER

NGUYEN, HOA CAO

ART UNIT PAPER NUMBER

2841

DATE MAILED: 05/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

10/765,772

Applicant(s)

CHERIAN, GABE

Examiner

Hoa C. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12, 13 and 19-37 is/are pending in the application.
- 4a) Of the above claim(s) 12, 13 and 19-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 22-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 12-13 and 19-21 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention group, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 3/29/06. Claims 1-11 and 14-18 are cancelled. Claims 22-37 are considered in this Office Action.

Specification

2. The abstract of the disclosure is objected to because the abstract must be in a separate page (the "Note" below the abstract must not be in the same page as the abstract). Correction is required. See MPEP § 608.01(b).

3. Claims 23-37 are objected to because of the following informalities:

Claims 23-27: The term "a pad" must be changed to "the pad" or "said pad", because the pad has been identified in independent claim 22.

Claims 28-37: The term "a joining means" must be changed to "the joining means" or "said joining means", because the joining means has been identified in claim 27.

Claims 30-31: The term "a ray" must be changed to "the ray" or "said ray", because the ray has been identified in claim 25.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 22-33 and 36-37 are rejected under 35 U.S.C. 102(e) as being anticipated by Eldridge et al. (US 6456099).

Regarding claim 22, as shown in figures 3A-3B, 5 and 15, Eldridge et al. disclose a pad 110/112 (a bond pad; see column 4, line 13; arbitrary selecting a center pad of the plurality of pads formed on the left column of figure 3A) on an electronic device 100 (an integrated circuit or a die, column 4, line. 12), the pad is used to joint such the device to a substrate (column 4, lines 15-22; it is noted that all IC/die is connected to a substrate or a circuit board), wherein the pad is formed in a certain shape (square shape or rectangular shape; it is noted that a pad can be in any shape either square or rectangular as shown in the figure), so as to inherently influence and control the shape and cross-section of the connection or joint 504/1518/1520 (a solder ball, column 4, line 23; column 10, line 56; column 6, line 53) that will be formed on top of it.

Examiner remarks: Because the shape of a bonding pad dictates the solder ball forming on top of it, therefore the pad inherently influence and control the shape and cross-section of the solder ball.

Furthermore, the limitation "so as to influence and control ..." is interpreted to only require the ability to so perform. In the case of product claim, only the structure of the claim distinguishes over the prior art.

Regarding claim 23, as shown in figure 3B, Eldridge et al. disclose the pad is elongated (rectangular shape), with the pad length larger than the pad width, with a long axis in general direction of the pad length and a short axis in the general direction of the pad width (considering an axis parallel to the length and an axis parallel to the width formed at the center of the pad).

Regarding claim 24, as shown in figures 3A and 3B, Eldridge et al. disclose the pad is elongated (rectangular shape), inherently to influence and control the shape and cross-section of the joint (the solder ball, column 4, line 22) that will be formed on top of it, so that the joint (the solder ball) cross-section will have an elongated shape as well (because solder ball formed in a rectangular pad will also has a rectangular shape in cross-section parallel to the surface of the pad), and thus the length of the cross-section will be larger than the width of the cross-section, with a long axis in the general direction of the pad length and a short axis in the general direction of the pad width (as explained in claim 23 above).

Examiner remarks: It is noticed that the limitation "in order to influence and control ..." is interpreted to only require the ability to so perform. In the case of product claim, only the structure of the claim distinguishes over the prior art.

Regarding claim 25, as shown in figures 3A and 3B, Eldridge et al. disclose the pad is oriented in a way that the short axis (parallel to the width, see claim 23 above) is

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in line with a ray (any imaginary line), which start at a fixation point of the device 100 (considering a point at the center of the device) and emanates towards the center of the pad.

Examiner remarks: Arbitrary selecting a center pad of the plurality of pads formed on the left column of figure 3A and imagine the pad is a rectangular pad as shown in figure 3B, a line from the center of the device will eventually emanates towards the center of the pad.

Regarding claim 26, as shown in figures 3A and 3B, Eldridge et al. disclose the pad is oriented in a way that the short axis (parallel to the width) is approximately in line with the ray, which starts at the fixation point (center point of the die 100) of the device 100 and emanates towards the center of the pad and could be within a few degree off from the direction of the ray.

Regarding claim 27, as shown in claim 24 above, Eldridge et al. disclose a joining means such as 504/1518/1520 (solder ball as mentioned in claim 22 above) provided on the pad 110 of the device 100, wherein the pad would inherently influence and control the shape and cross-section of the joining means (the solder ball) that will be formed on top of the pad 110, wherein the joint means (the solder ball) cross-section will have an elongate shape as well, wherein the length of said cross-section will be larger than the width of said cross-section, with a long axis in the general direction of the pad length and a short axis in the general direction of the pad width.

Regarding claim 28, as shown in claims 24 and 27 above, Eldridge et al. disclose the joining means as shown in claim 27 above, wherein said joining means has

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an elongated cross-section, wherein the cross-section length is larger than the cross-section width, with a long axis in the general direction of the cross-section length and a short axis in the general direction of the cross-section width.

Regarding claim 29, as shown in claim 23 above, the long and short axis are perpendicular to each other. Therefore, Eldridge et al. anticipate the claim.

Regarding claim 30, as shown in figures 3A and 3B, because the joint means formed on the pad and having a cross-section as same as the pad itself and since the pad facing the center point of the device, therefore the joint means is also oriented in such a way that the short axis of the joining means cross-section is in line with the ray emanating from the center point and reaching towards the center of the joining means cross section. Therefore, Eldridge et al. anticipate the claim.

Regarding claim 31, as shown in figures 3A and 3B, and because the joint means formed on the pad and having a cross-section as same as the pad itself and since the pad facing the center point of the device, therefore the joint means is also oriented in such a way that the short axis of the joining means cross-section is approximately in line with the ray emanating from the center point of the device, and reaching towards the center of the joining means cross section, and could be within a few degrees off from the direction of the ray; therefore, Eldridge et al. anticipate the claim.

Regarding claim 33, as shown in figures 5 and 15, Eldridge et al. disclose the joining means 504/1518/1520 (solder ball) has a generally uniform cross-section along its entire height, to look like a column with uniform cross-section.

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Regarding claim 34, as shown in figure 5, Eldridge et al. disclose the joining means 504/1518/1520 (solder ball) has a generally uniform cross-section along its entire height, to look like a column with uniform cross-section, except at the bases where there is a fillet.

Regarding claim 36, Eldridge et al. disclose the joining means as solder ball comprising solder material (column 10, line 59).

Regarding claim 37, Eldridge et al. disclose the joining means as solder ball comprising any suitable material inherently including conductive adhesive glue (column 10, line 58).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eldridge et al. in view of Higashiguchi (US 6316735).

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Regarding claims 34-35, Eldridge et al. disclose every limitation as shown in claim 28 above but failed to disclose the joining means has a smaller cross-section at about the middle of its height than the cross-section near its bases and looks like an hour-glass shape.

Higashiguchi, as shown in figures 1 and 3, discloses an electronic device 2 (chip mounting board, column 5, line 60) comprising connecting pads 12 (column 5, line 64) formed thereon and solder bump 27 (column 6, line 65) attached to the contact pad 12. The solder bump 27 has a smaller cross-section (a hand drum shape) at about the middle of its height than the cross-section near its bases (column 6, line 62 continuing column 7, line 25) and looks like an hourglass shape in order to save space and also to absorb a force to distort the solder part.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the teachings from Higashiguchi to make the joining means has a smaller cross-section at about the middle of its height than the cross-section near its bases and looks like an hour-glass shape in order to save space and also to absorb a force to distort the solder part.

Citation of Relevant Art

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Caletka et al. (US 6774474) disclose a partially captured oriented interconnections for BGA packages and a method of forming the interconnections.

Lo et al. (US 6757968) disclose a chip scale packaging on CTE matched printed wiring boards.

Spielberger et al. (US 6657134) disclose a stacked ball grid array.

Matsubara et al. (US 6573458) disclose a printed circuit board.

Lassar et al. (US 20050094382) disclose a connection pad layouts.

Sherman (US 5784262) discloses an arrangement of pads and through-holes for semiconductor packages.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoa C. Nguyen whose telephone number is 571-272-8293. The examiner can normally be reached on M-F.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kammie Cuneo can be reached on 571-272-1957. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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5/11/06



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